

REMARKS

An RCE is filed concurrently herewith. New claims 33 and 34 are added in this preliminary amendment.

Claims 1-3, 5-9, 11, 12 and 25-34 are pending in this application, with claims 33 and 34 being added. It is noted that the claim amendments, if any, are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicants specifically state that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

With respect to the prior art rejections, claims 1-3, 5-9, 11, 12 and 25-32 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Ota, et al. (JP 04-085972), further in view of Fujimoto, et al. (U.S. Patent No. 6,242,761).

This rejection is again respectfully traversed in the following discussion.

I. THE CLAIMED INVENTION

The invention, as described in independent claim 1 for example, is directed to an electrode for a p-type SiC that includes a first electrode material, and a second electrode material of aluminum (Al). The first and second electrode materials exhibit a eutectic reaction at a temperature of 600°C or lower and a layer made of the first electrode material is in contact with a surface of the p-type SiC (Application at page 3, lines 1-4; page 5, lines 17-21).

This structure is important because the formation of the first electrode material having such eutectic characteristics accelerates the eutectic reaction at lower temperatures and provides a better ohmic junction (Application at page 3, lines 5-12; page 4, lines 20-23).

Conventional SiC electrodes, as described in the Background of the present Application, use a combination of titanium (Ti) and aluminum (Al) in an effort to produce an ohmic electrode. However, such conventional SiC electrodes contain a large amount of Al to reduce resistance and need to be heat treated at temperatures of about 1000°C. As a result of

these high temperatures devices using such electrodes have reduced functionality and a decreased useful lifecycle caused by deterioration of surface morphology and thermal damage during heat treatment (Application at page 1, line 23-page 2, line 15).

In contrast, in an exemplary embodiment, this invention may provide an electrode for a p-type SiC having a good surface homology and little thermal damage to the semiconductor crystal layers caused by the formation of the electrode (Application at page 2, lines 18-22).

II. THE PRIOR ART REJECTION

The Examiner concedes that primary reference Ota fails to teach or suggest achieving an eutectic reaction at a temperature less than 600° C or use of germanium and relies upon secondary reference Fujimoto.

As clearly stated on page 5 of the USPTO translation, what primary reference Ota does teach for its p-type SiC electrode 7 is to use Ni (0.2μm)/Ti (0.02μm)/Al (0.5μm), which is subsequently heated by inert gas at 900-1000 °C for 5-10 minutes.

In contrast, the present invention teaches using Ge (60 nm)/ Ti (80 nm)/ Al (360 nm), which permits an eutectic reaction at a relatively lower temperature of 600 °C or less, as described at lines 23-25 on page 9.

There is no suggestion in Ota to replace Ni with Ge. Nor is there any suggestion to use a lower temperature of the claimed invention. Finally, there is no suggestion Ota that the thickness of materials deposited for this electrode will form the eutectic reaction. As described, for example, at Wikipedia.org, "eutectic reaction" is a term of art meaning that all constituents crystallize substantially simultaneously from the molten state and requires a predetermined mixture of such proportions that the melting point is as low as possible.

The Examiner relies upon secondary reference Fujimoto, alleging that this reference teaches "...*that germanium and nickel are equivalent electrode materials known in the art and that these materials show eutectic reactions at 600°C or less (i.e. 300°C)....*"

However, as Applicants explained in their previous responses, Fujimoto merely teaches the use of the alternative materials in making a nitride compound semiconductor and is not directed to a p-type SiC. There is no suggestion in Fujimoto that germanium and nickel are equivalent materials. Nor is there any suggestion in Fujimoto of providing the ratio of components that will cause the eutectic reaction.

Further, because of the wide array of materials that Fujimoto suggests may be used in place of the Pt, Ti, Pt layer structure in the nitride compound semiconductor, Fujimoto fails to recognize the criticality of using the first layer (Ge) and the second layer (Al) materials as claimed.

For example, as discussed in the Specification of the present Application, it is important that the first electrode material react with Si and exhibit an eutectic reaction with Al at a relatively low temperature (e.g., 600°C or lower). Since "eutectic reaction" is a term of art meaning that all constituents crystallize substantially simultaneously from the molten state, merely having elements listed in secondary reference Fujimoto in another environment does not satisfy the plain meaning of this term of art and the rejection currently of record fails to meet the initial burden of a *prima facie* rejection since all claim limitations are not satisfied in this rejection.

Therefore, as Fujimoto does not relate to a p-type SiC, there is no suggestion in Fujimoto to modify Ota as proposed by the Examiner and no indication in Fujimoto that a eutectic reaction will occur in the p-type SiC environment which even primary reference Ota clearly describes as being an extremely difficult environment in which to obtain desirable ohmic properties.

Because the combination of references fails to disclose or suggest all of the features recited in the rejected claim, withdrawal of the rejection is respectfully requested.

III. CONCLUSION

In view of the foregoing, Applicants submit that claims 1-3, 5-9, 11, 12 and 25-34, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

Serial No. 10/695,439
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8

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

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